do not exist. The very abnormal conditions under which some of these so-called organisms are found, would render it doubtful whether Bacteriums, Vibrios, &c., ought to be considered as independent organisms in any higher sense than are white blood-corpuscles, pollen-grains, mucus-corpuscles, or spermatozoa.

VII. "On a Colloid Acid, a Normal Constituent of Human Urine." By William Marcet, M.D., F.R.S. Received May 28, 1864. (Abstract.)

The object of the present communication is to describe the mode of extraction and the properties of an acid of a colloid nature which is always present in healthy human urine, and appears destined to become of great importance in Physiological Chemistry.

With the view of separating this acid from the urinary secretion, the fluid is mixed with animal charcoal, concentrated, and filtered, and the filtrate, after precipitation with baryta-water, is dialyzed for about twenty-four hours. The dialyzed liquid, after subsequent filtration and concentration, is mixed with basic acetate of lead, which precipitates the colloid acid as an insoluble lead-salt, along with a little hydrochloric acid and other impurities. The precipitate should be thoroughly washed, decomposed with sulphuretted hydrogen, and again treated with animal charcoal. When the acid is required in a pure state, the hydrochloric acid present is removed with carbonate of silver, the excess of the silver precipitated with sulphuretted hydrogen, and, after boiling to evolve this last substance, basic acetate of lead is again added. The lead-salt perfectly washed may be considered pure, and the pure acid can be obtained from it by decomposition with sulphuretted hydrogen.

The acid is very slow to decompose when exposed to the air. It may be considered to undergo no loss or decomposition by being boiled, as shown by direct experiment. After concentration by heat, its colour darkens and it becomes syrupy, possessing a sharp acid taste, with a slight acrid and astringent after-taste; the taste is perceptible in the solution when very dilute: no crystals of the acid could be obtained in the syrup. Dried at a temperature under 212° F., the acid has the appearance of a transparent varnish; it is very hygroscopic, and dissolves readily in water, though not apparently in alcohol (sp. gr. ·820) or in ether. When burnt, the colloid acid chars, emitting a pungent and irritating smell, and after complete combustion, nothing but the minutest trace of inorganic residue remains. Although strictly a colloid, this acid in the free state passes through a dialyzer, but not so readily as a crystalloid. When under the form of a compound, its property of dialyzing appears much diminished. I could not find that it exerted any action on polarized light*.

* This acid does not precipitate egg-albumen. It precipitates casein, but an excess does not appear to redissolve the precipitate as in the case of acetic acid.

Composition of the Colloid Acid.

The acid was found to consist only of carbon, hydrogen, and oxygen. I have not yet succeeded in establishing its ultimate quantitative composition, but it appears to be very poor in hydrogen and rich in carbon. The atomic weight of the substance was found by the analysis of its insoluble lead-salt, and of its baryta-salt. I determined the lead in the lead compounds from six different samples of urine; the average in 100 parts was—

Oxide of lead	66·3
Acid.....	33·7
	100·0

The analysis of the baryta compound yielded in 100 parts—

Baryta.....	72·2
Acid	27·8
	100·0

Corresponding to the atomic weights

for the lead compound	Oxide of lead	111·5
	Acid	56·7
		168·2
for the baryta compound	Baryta	76·5
	Acid	29·5
		106·0

It is therefore very obvious that the acid forms two salts, an acid and a neutral salt; we shall adopt the number 28·35 $\left(\text{or } \frac{56{\cdot}7}{2}\right)$ for the atomic weight of the new acid. The fact of there existing two different compounds of the acid, explains many chemical phenomena exhibited by this substance and its salts.

Compounds of the Colloid Acid of Urine.

The neutral salts are all soluble.

Lead-Salts.—The colloid acid forms two lead-salt—sone which is insoluble in water, and contains two equivalents of acid, and one which is soluble in water, and evidently contains one equivalent of acid.

The insoluble compound is obtained by adding basic acetate of lead to an aqueous solution of the acid or of its neutral salts. An excess of the basic acetate redissolves the precipitate, which reappears on the addition of dilute nitric acid, to be finally redissolved in an excess of the mineral acid. The whole of the colloid acid is not, however, precipitated by basic acetate of lead, principally on account of the formation of a certain quantity of neutral acetate of lead, which I found to have the property of dissolving the insoluble colloid lead-salt. On boiling a mixture of the insoluble lead

compound with neutral acetate of lead, acetic acid was given off, a confirmatory proof of the insoluble lead compound being an acid salt; in this case one equivalent of the colloid acid combines with one equivalent of oxide of lead of the neutral acetate, two equivalents of the neutral lead-salt of the colloid acid being thus formed,

$$PbO, 2(Acid) + PbO, C_4 H_3 O_3 = 2(PbO, Acid) + C_4 H_3 O_3.$$

This shows that it is not possible to estimate with accuracy the amount of the acid in urine by means of basic acetate of lead.

When the acid is boiled with an excess of hydrated oxide of lead, an insoluble compound is formed; if the acid be in excess, a compound soluble in hot water, but precipitating on cooling, is obtained: I have not yet determined the composition of these two lead-salts.

Baryta- and Lime-Salts.—These salts are easily prepared from the carbonates. They contain one equivalent of the acid, are soluble in water, and yield precipitates with basic acetate of lead, nitrate of silver, and protonitrate of mercury and tannic acid; the more concentrated the solution, the more abundant the precipitates. A very slight precipitate occurs by adding neutral acetate of lead to salts of the acid; other reagents fail to yield precipitates.

The acid dissolves silver from the carbonate, but I could not neutralize it perfectly by such means. The lime-salt of the acid cannot be entirely decomposed by boiling it with carbonate of silver.

When the acid is boiled with black oxide of copper, copper is readily dissolved.

Physiological relations of the Colloid Acid of Urine.

I endeavoured to determine approximately the quantity of the colloid in a given bulk of the urinary secretion, and extracted from 8 litres 4·46 grammes of this substance, which, however, must fall short considerably of the real amount of the acid present.

It may be considered as existing in all probability in the blood, where there is little doubt that it acts an important part in the phenomena of the secretion of gastric juice, by displacing the hydrochloric acid from chloride of sodium, combining with the sodium; the soda-salt would remain in the blood, being a colloid compound, while the free hydrochloric acid would find its way into the stomach. An experiment I performed in connexion with this subject bears out the present view.

The formation of the colloid acid appears to result from some transformation of the colloid non-nitrogenous constituent of the liver known as the glucogenic substance. When better acquainted with the chemical composition and physiological relations of the colloid acid of urine, I shall be able to give it an appropriate name.